


NEW UTILITY PATENT APPLICATION TRANSMITTAL <i>(only for new nonprovisional applications under 37 CFR 1.53(b))</i>	Attorney Docket Number	5122 US
	First Named Inventor	Walter Lee
	Total Pages in this Submission	53
	Express Mail Label No.	EL482472190US

13553 U.S. PTO
 09/29/00

09/29/00

APPLICATION ELEMENTS	ACCOMPANYING APPLICATION PARTS
1. <input type="checkbox"/> Fee Transmittal Form (in duplicate) <input type="checkbox"/> Check Enclosed 2. <input checked="" type="checkbox"/> Specification <i>(preferred arrangement set forth below)</i> <input checked="" type="checkbox"/> Descriptive Title of the Invention <input checked="" type="checkbox"/> Cross Reference(s) to Related Case(s) <input checked="" type="checkbox"/> Statement Regarding Fed sponsored R & D <input checked="" type="checkbox"/> Background of the Invention <input checked="" type="checkbox"/> Brief Summary of the Invention <input checked="" type="checkbox"/> Brief Description of the Drawing(s) <input checked="" type="checkbox"/> Detailed Description <input checked="" type="checkbox"/> Claim or Claims <input checked="" type="checkbox"/> Abstract of the Disclosure 3. <input checked="" type="checkbox"/> Drawing(s) (<i>when necessary per 35 USC 113</i>) 4. Oath or Declaration a. <input checked="" type="checkbox"/> New Declaration <input type="checkbox"/> Executed b. <input type="checkbox"/> Copy from a prior application (37 CFR 1.63(d)) <i>(for continuation/divisional with Box 17 completed)</i> i. <input type="checkbox"/> DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b). 5. <input type="checkbox"/> Incorporation by Reference (useable if Box 4b is checked). The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.	6. <input type="checkbox"/> Assignment & Assignment Recordation Cover Sheet 7. <input type="checkbox"/> Certified Copy of Priority Document(s) <i>(if foreign priority is claimed)</i> 8. <input type="checkbox"/> Information Disclosure Statement & PTO-1449 <input type="checkbox"/> Copies of IDS Citation(s) 9. <input type="checkbox"/> Preliminary Amendment 10. Small Entity Statement <input type="checkbox"/> New Statement enclosed <input type="checkbox"/> Statement filed in prior application. Status still proper and desired 11. <input checked="" type="checkbox"/> Return Postcard 12. <input type="checkbox"/> 13. <input type="checkbox"/> 14. <input type="checkbox"/> 15. <input type="checkbox"/> 16. <input type="checkbox"/>
ADDRESS TO: Box Patent Application Commissioner for Patents Washington, D.C. 20231	

17. If a **CONTINUING APPLICATION**, check appropriate box and supply the requisite information below and in a preliminary amendment:
☐ Continuation ☐ Divisional ☒ Continuation-in-part (CIP) of prior application No: 09/167,102
 Prior application information: Examiner: Alexander Kalinowski Group/Art Unit: 2761

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SCORE BASED DECISIONING

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CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. application Serial No. 09/167,102, filed on October 5, 1998, entitled "Risk Determination and Management Using Predictive Modeling and Transaction Profiles for Individual Transacting Entities," incorporated herein in its entirety, and which is a continuation of U.S. application Serial No. 07/941,971, filed on September 8, 1992, entitled "Fraud Detection Using Predictive Modeling" and issued as U.S. Patent No. 5,819,226, which is incorporated herein by reference in its entirety. This application is also a continuation-in-part of U.S. patent application Serial No. 60/195,156, filed April 6, 2000, entitled "Identification And Management Of Fraudulent Credit/Debit Card Purchases At Merchant Ecommerce Sites," and incorporated herein by reference in its entirety.

BACKGROUND

1. *Field of the Invention*

This invention relates generally to the processing of a request for an interaction. In particular, the invention relates to assisting an entity to determine conditions under which to obtain additional information about a user to meet the needs of the entity without causing the user to have an adverse reaction.

2. *Background of the Invention*

Companies that conduct business on the Internet face challenges in obtaining enough reliable information about a user to meet the needs of the company without causing the user to

have an adverse reaction, e.g., to terminate the interaction. For example, typically an on-line merchant wants to obtain enough information about a potential transaction with a customer to reliably indicate that the customer is not acting fraudulently. However, in doing so, the on-line merchant can cause the potential customer to terminate the transaction, for example, by asking
5 for too much information, or for too personal information.

Credit card purchases of goods and services over the Internet are now common. In a typical transaction, a consumer selects one or more items to purchase, provides information identifying himself, such as his name and address, and provides payment information, e.g., credit card information.

10 Unfortunately, merchants doing business on the Internet face great exposure to credit card fraud. Stolen cards are used in approximately 1.2% of all Internet sales, causing on-line merchants to claim losses due to credit card fraud of more than \$200 million in 1999. Currently, about 0.06% to 0.09% of traditional sales are fraudulent, making on-line transactions more than
15 10 times as likely to involve fraud as traditional retail transactions. At least three factors make on-line sales more susceptible to fraud than sales made at retail shopping venues. For on-line sales, the buyer does not have to 1) be physically present; 2) hand over a credit card, or 3) sign a receipt. As a consequence, on-line merchants presently suffer a variety of fraud-related costs. These costs include:

1) Loss of Payments & Merchandise

20 On-line fraud results in large revenue losses for Internet merchants. When an Internet merchant is a victim of fraud, it loses both the payment and the merchandise. In contrast, if a cardholder's card is used fraudulently and the merchant has a signed receipt as record of the transaction, the issuer usually absorbs the fraudulent charges.

With Internet commerce, however, the merchant, not the issuer, absorbs the fraudulent purchases. Regulations created by card issuer associations specify that in card-not-present (CNP) situations, merchants assume the full risk of purchases made by credit card, independent of authorizations made by issuing banks. Because CNP transactions are the standard for e-commerce, the current framework shifts the burden of these losses primarily to the merchants. Indeed, for companies that do all of their business over the Internet based on CNP transactions, this loss exposure can be in the tens of millions of dollars.

Beyond use of a stolen credit card or of a fabricated card number, other types of fraud frequently occur in the context of on-line purchasing. Customers more easily dispute valid charges related to on-line purchases as opposed to valid charges related to traditional retail purchases. For example, a husband may make charges to an on-line merchant and deny them to his wife. The wife, in turn, may then call the card issuer and dispute the on-line merchant's bill. Though these charges are valid, the card company may decide in favor of their customer, and the merchant becomes responsible for the chargebacks. A chargeback is a charge levied on a merchant for the amount of a purchase that was charged on a credit card and that the credit card holder successfully disputes. In addition to chargebacks, merchants are responsible for loss from disputed charges when customers claim non-receipt of goods, non-arrival of goods due to incorrect shipping addresses, or goods refused on delivery.

2) Loss from Shipping Charges

The charges for shipping goods are normally paid by consumers. When on-line fraud occurs, however, the on-line merchant must cover the cost of shipping.

3) Loss from Human Intervention

Presently, an on-line merchant can attempt to use parameter-based rules and negative files to determine credit card fraud. Parameter based rules use if/then logic to attempt to

identify aberrant behavior based on specific data such as negative file information. Negative files are database files that track negative customer behavior. One can access the negative file database using a key, such as credit card number, or Social Security number. However, using parameter-based rules and negative files often leads to time-consuming fraud investigations.

- 5 The fraud investigations, in turn, lead to rising administrative costs as a result of the need to increase staff to perform the investigations.

4) Loss of Valued Customers

Poorly managed fraud-control systems can lead to decreased customer satisfaction resulting in lost revenues to retailers. Many on-line retailers burden their customers with

- 10 lengthy and complex on-line order forms in an attempt to minimize fraud. However, these lengthy forms frustrate and confuse customers potentially reducing the customer's good will toward the retailer. A frustrated and/or confused customer often either abandons their order of defaults to a competitor when initiating a transaction in the future. In the same vein, legitimate customers become insulted when inaccurate fraud control rules reject their orders.
- 15 Such customers often permanently migrate to other vendors where they find better treatment. Merchants then spend valuable marketing dollars attempting to replace the customers lost as a result of poorly managed fraud-control systems.

5) Loss from Chargeback Fees

- As noted above, a chargeback is a charge levied on a merchant for the amount of a
- 20 purchase that has previously been charged to a payment card, and that has been successfully disputed by a customer. When a chargeback is processed, the merchant typically pays a fee of \$15.00 to \$25.00. If the merchant disputes the chargeback and wants to re-present, or re-issue, the charge, an equivalent fee is billed to the merchant. If the card issuer again decides in favor of the customer and processes a second chargeback, the merchant is charged yet another fee,

and this time the charge cannot be re-presented. The merchant can, however, arbitrate the charge, whereupon the issuing bank can charge an up-front, non-refundable fee of up to \$50.00. Thus, for low cost items (e.g., books, clothes, etc.) merchants simply absorb the loss rather than pay the higher chargeback fees.

5 **6) Loss from Chargeback Fines**

In addition to paying a fee for each chargeback, issuing banks can levy fines on merchants having too many chargebacks. Typically 1.5-3.0% of the merchant's chargeback volume, such fines can range from a few hundred dollars per month, to \$10,000 or even \$100,000 per month, with fines escalating higher as chargebacks continue unabated.

10 **7) Loss of Credit Card Privileges**

The reputations of credit card brands are damaged when legitimate customers are victimized by fraud, even if they do not absorb the actual financial losses. Rules are thus instituted by the credit card brands to prevent merchants from allowing too many fraudulent transactions to occur. If fraudulent transactions exceed a specified small percentage of a merchant's overall credit-card sales, the merchant can lose the privilege of receiving payment through a credit card issuer altogether. Obviously, the ability to accept credit cards for payment is extremely important to an on-line merchant. Thus, as noted above, out of fear of losing the privilege of accepting credit cards for payment, on-line merchants are responding with generalized, lengthy and complex on-line order forms in an attempt to reduce fraud.

20 These burdensome forms cause the loss of customers. Those on-line merchants that can solve the problem of fraud without using generalized, burdensome order forms stand to gain significant market share.

8) Limitations of Most Fraud-Risk Solutions

On-line retailers have been implementing a range of fraud detection and reduction techniques to combat the problems described above. Typical solutions that on-line merchants have deployed include the use of rule sets and basic checks such as address verification.

a) Rule sets

Rule sets use if/then logic to attempt to identify aberrant behavior using specified data such as negative file information. A typical rule might read: "IF the transaction amount is over \$1000 and the ship-to address is outside North America THEN decline the transaction". Rule-based fraud detection and reduction methods by themselves are limited because they:

- Fail to detect an unacceptably large amount of fraud
- Result in high false-positive rates (a false-positive result occurs when a fraud detection method flags a valid transaction as potentially fraudulent)
- Create a high volume of cases requiring human intervention to investigate transactions identified as potentially fraudulent
- Are slow to adapt to new methods of committing fraud, requiring new rules to identify the fraud

b) Address Verification Service (AVS)

AVS attempts to verify that the billing address for a credit card presented by a customer is the same as the customer's address. For example, a customer may provide her address and zip code to a merchant. The merchant then transfers at least part of the address and zip code data along with the credit card number to a server for approval. The server compares the zip code and billing address data with the physical address to which a cardholder's credit card is registered. Once the server compares this information, the server sends the merchant a response to the AVS request indicating the result of the comparison.

AVS was designed for mail and telephone orders and many on-line merchants presently use AVS. However, AVS has no international fraud detection capability, is not designed for on-line transactions, and is available only for certain credit cards. Furthermore, there are many legitimate instances when the shipping address and billing address are different. Such instances include the purchase of a gift using a personal credit card to ship goods to a work address and vice versa or when there is no shipping address at all. There may be no shipping address when companies deliver the purchased goods or services electronically. Items that companies can deliver electronically include software, reference material, subscriptions to an on-line service, and digital images.

9) Other Problems Associated with Obtaining Information from a Customer

As noted above, companies face challenges in obtaining enough reliable information about a customer to meet the needs of the company without causing the customer to have an adverse reaction. A variety of companies in addition to on-line merchants face these challenges. In-bound call centers, e.g., customer service centers or catalog ordering phone centers, as well as out-bound call centers, e.g., telemarketing operations, attempt to obtain information from a customer without causing the customer to have an adverse reaction.

A customer can have a variety of adverse reactions. The customer may terminate her interaction with the merchant or provide false and/or incomplete information to the merchant. In addition, the merchant can lose the customer's goodwill; if a customer faces lengthy, confusing, or inconvenient forms or questions when interacting with the merchant, the customer may default to a competitor of the merchant when initiating transactions in the future.

An entity may collect information from a user for a variety of reasons distinct from preventing fraud. These reasons can include gathering information for marketing or for

research. Companies often use registration forms for such purposes. Completion of the registration form is often a prerequisite for gaining access to portions of a site or to desirable content. Such companies do not want to cause the customer to terminate her interaction with the company, provide false or incomplete information, or lose good will toward the company.

- 5 Thus, there exists a need for a way of determining the conditions under which to request information from users so as to foster the entity/ user interaction.

SUMMARY OF INVENTION

The invention aids an entity to determine the conditions under which to request additional information about a user during an entity/user interaction to meet the needs of the entity, while reducing the risk that a user will have an adverse reaction, such as terminating the interaction. As one example, the invention aids Internet merchants by detecting credit card transactions that are likely to be fraudulent, and providing the merchants with mechanisms for selectively requesting additional information from the user that may reduce the likelihood of fraud, and for managing a suspected transaction as it occurs.

According to one embodiment of the invention, relevant information about a user's requested transaction with a merchant, such as identifying information about the buyer and the amount of the transaction, is evaluated (scored) to determine the likelihood that the transaction is fraudulent. Depending on the score, the merchant may fulfill the order, decline the order, or request more information. Instead of being scored for fraud, the transaction may be scored with respect to any other factor that a merchant deems useful to know when deciding whether or not to complete the transaction.

The additional information that may be requested is typically useful in determining whether or not the transaction should be completed. In determining what information to request from the buyer, one embodiment calculates metrics for the value of additional data provided by one or more proposed follow-up question sets.

In addition, a friction model determines the respective attrition costs of each proposed follow-up questions set. An attrition cost is a measure of the likelihood that presenting a question set to a user will cause that user to terminate the interaction.

In a preferred embodiment, an information value prediction model calculates metrics for the value of additional data provided by specified question sets derived from question set data. Similarly, a friction prediction model calculates attrition costs for specified question sets derived from question set data.

5 Based on the metrics for the value of the additional data and the attrition costs, an optimization module determines the expected value of fulfillment of the transaction for specified question sets, and chooses a question set with a high expected value of fulfillment. In a preferred embodiment, the expected value of fulfillment is a function of the probability of non-attrited fulfillment. Furthermore, the expected value of fulfillment can be a function of the
10 monetary value of the transaction.

Credit card transactions are only one application of the invention. The invention can apply to other situations in which an entity wants to selectively obtain information from its users while fostering the entity/user interaction. Thus, one version of the invention provides a computer-implemented method for processing a request for an interaction. The method
15 includes: (a) receiving a request for an interaction from a user, the request including a first set of interaction data for variables descriptive of the interaction; (b) determining a value of the interaction based on the first set of interaction data; and (c) responsive to the value of the interaction, selectively obtaining additional data from the user. The invention may also be used for other types of transactions, such as questionnaires, surveys, and other information
20 gathering interactions. Likewise, even for purchase transactions, the invention is not limited to usage with credit cards, but can be used with other forms or types of payment as well.

The invention contemplates entity/user interactions where communication with the user can occur over media other than a computer network or through a customer service representative. Thus, communication with the user can occur through a variety of modes

including network-facilitated, telephone-facilitated, or in-person communication. For example, the user can call into a call center, e.g., a customer service center or a phone center for ordering from a catalog. Alternatively, the entity can contact the user through an out-bound call center, e.g., a telemarketing operation. In either case, the operators or voice response units can operate
5 from a script that guides them as to what questions to ask and when. The script can be devised as described herein.

The features and advantages described in this summary and the following detailed description are not all-inclusive, and particularly, many additional features and advantages will be apparent to one of ordinary skill in the art in view of the drawings, specification, and
10 claims hereof. Moreover, it should be noted that the language used in the specification has been principally selected for readability and instructional purposes, and may not have been selected to delineate or circumscribe the inventive subject matter, resort to the claims being necessary to determine such inventive subject matter.

BRIEF DESCRIPTIONS OF THE DRAWINGS

FIG. 1 is an illustration of the system architecture of one embodiment of the present invention.

FIG. 2 is a flow chart for operation of one embodiment of the system of FIG. 1.

5 FIG. 3 is a flow chart for operation of one embodiment of the interaction-processing server of FIG. 1.

FIG. 4 is flow chart for the operation of one embodiment of the decision module of FIG. 1.

10 FIG. 4A is a flow chart for the operation of an alternative embodiment of the decision module of FIG. 1.

FIG. 5 is a flow chart for the operation of one embodiment of the question set optimization module of FIG. 2.

FIG. 5A is a flow chart for the operation of an alternative embodiment of the question set optimization module of FIG. 2.

15 FIG. 6 shows a first form sent to a client's browser by the system of FIG. 1 in response to a request for a transaction.

FIG. 7 shows a second form selectively sent to a client's browser by the system of FIG. 1.

The figures depict a preferred embodiment of the present invention for purposes of illustration only. One skilled in the art will readily recognize from the following discussion
20 that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the invention described herein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention aids an entity to selectively request additional data about a user to serve the needs of the entity without causing the user to have an adverse reaction. Adverse reactions include terminating the interaction, providing false or incomplete responses, and losing good will for, or developing ill will for, the entity. One embodiment of the invention concerns customers requesting transactions with on-line merchants. More specifically, this embodiment aids a merchant by detecting Internet credit card transactions that are likely to be fraudulent. This embodiment then provides the merchant with mechanisms for managing a suspected transaction as it occurs by selectively obtaining additional information that can be useful in refining the estimation of the likelihood of fraud.

Referring now to Fig. 1, there is shown a system 101 in accordance with one embodiment of the invention. This embodiment operates in the context of a merchant doing business through the Internet or other network. However, as noted above, the invention contemplates entity/user or merchant/customer interactions where communication with the user/customer can occur over media other than a computer network or can occur through a customer service representative 119. The customer service representative 119 can communicate with a customer 117 over the phone or in person. For example, a customer 117 can call into a call center, e.g., a customer service center or a phone center for ordering from a catalog. Alternatively, the merchant can contact the user through an out-bound call center, e.g., a telemarketing operation. In either case, the operators or voice response units can operate from a script that guides them as to what questions to ask and when. The script can be devised as described herein.

In the on-line merchant context, the merchant operates a merchant server 120, which provides customers with access to the merchant's web site 115. The customers access the merchant server 120 using their own client computers 118 via the Internet or other network. Only one client computer 118 is shown for convenience, as those of skill in the art appreciate
5 the general client-server operation of the Internet.

More specifically, the merchant server 120 may be characterized as including a fulfillment system 116 and a decision module 114. The fulfillment system 116 interfaces with the client computer 118 to provide access to the merchant's inventory, to determine which items are available in stock, to gather information from the customer related to the transaction,
10 and to otherwise handle the fulfillment of the customer's request.

Thus, from a client computer 118, a customer typically browses or searches the merchant's website 115 prior to selecting a product for purchase. The customer then submits a purchase request for a selected product and the fulfillment system 116 handles the request. A purchase request is one form of a requested interaction by a user with an entity. Typically, the
15 fulfillment system 116 gathers some initial information regarding the transaction. With reference to FIG. 6, the merchant server 120 can send the client computer an initial form to collect a limited amount of data. In one embodiment, the initial form collects the minimal amount of information necessary to fulfill the order, e.g., credit card type, credit card account number, and customer name. The accumulated initial information may include the amount of
20 the transaction, credit card type, credit card number, customer name, or other information the merchant deems desirable. Thus, the request includes a first set of interaction data for variables descriptive of the interaction.

Once the merchant server 120 obtains initial data sufficient to process the client's requested transaction, the merchant server 120 forwards the initial data to the interaction-

processing server 100. In one embodiment, the interaction-processing server runs the transaction-scoring model 107 to provide a fraud score for the requested transaction. The transaction-scoring model and its operation are described in U.S. Patent No. 5,819,226, entitled “Fraud Detection Using Predictive Modeling” and incorporated herein by reference in its entirety.

Interaction-processing server 100 provides the merchant with an evaluation of the initial information that allows the merchant to decide whether or not to complete the transaction. In the preferred embodiment, it provides an evaluation of the likelihood that the transaction is fraudulent. This likelihood of fraud evaluation lets the merchant decide, essentially in real time, whether to complete the transaction, decline to complete the transaction, or to request additional information from the customer.

More particularly, in the illustrated embodiment, the interaction processing system 101 includes an interaction-processing server 100, which in turn includes an interaction-scoring model 107, an information value prediction model 106, a friction model 108, and an optimization module 110. The interaction-processing server 100 is in communication with historical interaction data 102, user profile data 112, and question set data 104.

The interaction-scoring model 107 is a statistical model that predicts (classifies) a characteristic of the transaction based on the initial transaction data received from the merchant server 120. In an embodiment where the concern of the merchant is credit card fraud, the interaction scoring model 107 is a fraud prediction model that estimates (scores) a transaction with a transaction score (e.g. fraud score) indicative of the likelihood that the transaction is fraudulent, based on the initial transaction information.

As noted, the interaction-scoring model is not limited to evaluating the likelihood of fraud. Other characteristics of an interaction may likewise be scored or classified. For example, the system can score the likelihood 1) that a client will provide an honest response, 2) that a client is a good credit risk, for example, in the context of a loan application, or 3) that a client will make a good research subject.

The interaction-processing server 100 returns the transaction score to the merchant server 120. The decision module 114 receives the transaction score and evaluates the score with various criteria or filters that can be selected by the merchant. Typically, the merchant selects two thresholds, e.g., UpperBound and LowerBound. Transactions with transaction scores below LowerBound are automatically fulfilled; transactions with transaction scores above UpperBound are automatically declined, assuming that the system 101 is designed to have a high score indicate an undesirable transaction. Obviously, the system can be designed to use a low score to indicate an undesirable transaction.

To maximize the merchant's revenue, it is desirable for the merchant to fulfill at least some of the transactions scored between LowerBound and UpperBound. To do so requires that additional information be acquired from the customer. However, experience has shown that when more information is requested, a customer is often more likely to terminate (attrite) the transaction, thereby resulting in a lost sale. This is just one aspect of the phenomenon of "abandoned shopping carts" that on-line merchants face. Thus, the system aids a merchant in selectively requesting additional data about a user in such a way that the likelihood of the user terminating the transaction is reduced.

In other words, a system according to the invention allows a merchant to request additional information from selected customers, e.g., customers with fraud scores above a

threshold level. In addition, the system can help a merchant to evaluate the value of additional information versus the annoyance suffered by the customer in providing the additional information. Merchants may want to collect information about customers either for purposes directly related to the transaction, e.g., to reduce the likelihood of fraud, or unrelated to the transaction, e.g., for marketing and demographic analysis.

Returning to FIG. 1, in one embodiment, the interaction-processing server 100 performs fraud estimation using a statistical model of fraudulent transactions. An interaction processing system 101 contains historical interaction data, e.g., historical transaction data, to enable the creation of an interaction-scoring model 107. The historical data contains the same types of information that merchants, in the operational system, transmit to the interaction-processing server 100 for each interaction, e.g., transaction. In addition, the historical data is tagged to identify which transactions are subsequently proved to have been legitimate, and which transactions are subsequently proved to have been fraudulent.

One embodiment of the system uses historical data to create buyer profiles. The system stores the buyer profiles in the form of user profile data 112. The system creates a buyer profile for each buyer who conducts a transaction with an Internet merchant connected to the system. A multi-keyed algorithm associates various transactions with respective buyers. U.S. patent application Serial No. 60/195,156, filed April 6, 2000, entitled "Identification And Management Of Fraudulent Credit/Debit Card Purchases At Merchant Ecommerce Sites," and incorporated herein by reference in its entirety, describes the multi-keyed algorithm. The multi-keyed algorithm accumulates and profiles transactional information with respect to different keys that can be used to identify a buyer.

Each buyer's profile contains information summarizing transactions by the buyer including transactions the buyer has executed over the Internet with merchants connected to the system. The profile includes information typifying those transactions, e.g., typical amounts, type of purchase, type of merchant, and hour of the day. A system according to one

5 embodiment of the invention can develop a statistical model that, based on historical interaction data, estimates (scores) the likelihood of fraud in a particular transaction given the information associated with the transaction as well as the profile of the buyer in that transaction. In other words, the user profile data 112 includes a customer history database that keeps record of prior customer transactions. The database can include statistics as to

10 transaction performance such as average purchase amount or percent of purchases made in a particular geographic area.

With reference to FIGS. 2 and 4, once the interaction-scoring model 107 has determined an interaction score 124, the interaction-processing server 100 sends a first score, score-1, to the decision module 114 in the merchant server 120. Given score-1, one embodiment of the

15 decision module 114 determines 126 whether the score is less than a LowerBound T1. If the score is below LowerBound T1, the decision module indicates to the fulfillment system 116 to proceed with the request for an interaction, e.g., a purchase request. If the score is equal to or above LowerBound T1, the decision module determines 128 whether the score is above an UpperBound, T2, where T2 is greater than T1. If the score is above UpperBound T2, the

20 decision module 114 indicates to the fulfillment system to decline 134 to fulfill the request for an interaction, e.g., to decline to fulfill the purchase request. As noted above, another embodiment can use a low score to indicate an undesirable transaction.

In the illustrated embodiment, if the score is between LowerBound T1 and UpperBound T2 inclusive, the decision module 114 sends a request to the interaction-processing-server 100 to

obtain 136 a follow-up question set. With reference to FIG. 5, there is shown a flowchart of one process for obtaining additional information. The interaction-processing server obtains 144 data representing a plurality of follow-up question sets from question set data. A question set can contain one or more questions. The question set optimization module then determines the expected value of fulfillment for the selected plurality of question sets and selects a question set with a high expected value of fulfillment.

In a preferred embodiment, the information value prediction model uses the information obtained to create the fraud score to determine the value of the missing information represented by the question set. In addition, a friction model, using similar information to that obtained by the transaction-scoring model, determines the attrition cost of the question set. An attrition cost is a measure of the likelihood that presenting a question set to a user will cause that user to terminate the interaction.

The question set optimization module receives the value of the missing information and the attrition cost. Based on this information, the question set optimization module determines the probability of non-attrited fulfillment after use of the question set and stores the probability. In one embodiment, the probability of non-attrited fulfillment is the probability of non-attrition multiplied by the value of the missing information, i.e., the information value metric. The value of the additional information, i.e., the information value metric, can represent the probability that the interaction value will cross a specified threshold if the interaction value is based on data that includes a response to the follow-up question set.

The optimization module then determines if there is another question set to evaluate. If there is another question set, the optimization module repeats the process outlined above for the next follow-up question set. The system repeats this process for all candidate question sets. Finally, the optimization module selects the question set with

the highest probability of non-attributed fulfillment and returns data representing the selected question set to the merchant server.

With reference to FIG. 5A, there is shown a flowchart for another process for obtaining information. The interaction-processing server samples 145 the question set space derived from the question set data. Using information obtained to create the fraud score, the information value prediction model then determines 146 the value of the missing information represented by the sampled question sets. In addition, a friction model, using similar information to that obtained by the transaction-scoring model, determines 148 the attrition cost of the sampled question sets.

A question set optimization module receives the value of the missing information and the attrition cost. Based on this information, the question set optimization module determines 152 the probability of non-attributed fulfillment after use of the question set and stores the probability. More generally, based on this information, the question set optimization module can determine the expected value of fulfillment. The optimization module can then apply a search procedure 147 using the results provided by the sampled question sets, to search for a question set that provides a high expected value of fulfillment. The search procedure can use methods known to those of skill in the art such as steepest descent or greedy algorithm methods to search for a question set that meets specified search criteria without evaluating every possible combination of candidate questions.

If the search is successful based on the previously sampled question sets, e.g., if a question set meets specified search criteria, the optimization module selects that question set. If the search is unsuccessful based on the previously sampled question sets, the search procedure selects more question sets from the question set space and the interaction-processing server repeats steps 146, 148, 152, and 147.

The merchant server 120, in turn, forwards the selected question set to the client computer 118. FIG. 7 illustrates a selected question set embedded in a form that a merchant server 120 can send to a client computer 118. This question set is requesting a customer's home address including street, city, state, and zip code, and the maiden name of the customer's mother. The follow-up question set is sent only to a customer who has scored between a LowerBound and an UpperBound, inclusive. Thus, the majority of customers are not bothered with a follow-up question set. Furthermore, the follow-up question set illustrated in FIG. 7 is chosen for the customer so as to increase the likelihood of non-attributed fulfillment.

With reference again to FIGS. 2 and 4, upon receiving the customer's response to the follow up question set, the merchant server 120 forwards the additional information to the interaction processing system 101. The system 101 rescores the requested transaction and sends the revised score, score-2, to the decision module 114. In one embodiment, if the revised score is below a MiddleBound, T3, the module 114 indicates to the fulfillment system 116 to fulfill the request. If the revised score is not below MiddleBound T3, the module indicates to the fulfillment system to decline to fulfill the request. The following table summarizes the decision module outcomes as a function of score.

	<u>S<LB</u>	<u>LB<S<Mid</u>	<u>Mid<S<UB</u>	<u>UB<S</u>
1 st score	fulfill	NA	NA	reject
2 nd score	fulfill	fulfill	reject	reject

where LB = LowerBound, Mid = MiddleBound, UB = UpperBound, and NA = not applicable.

In a second embodiment, if the revised score is greater than MiddleBound T3, the system can obtain and forward to the customer yet another follow-up question set. In a third

embodiment, the decision module 114 can take into account the value of the transaction. If, upon receipt of the customer's response to the follow-up question set, the score is greater than MiddleBound T3 and yet the value of the transaction is above a specified level, the decision module 114 may indicate to the fulfillment system 116 that human intervention is warranted.

- 5 Human intervention can take a variety of forms including review by a manager or a telephone call by a service representative.

With reference to FIG. 4A, a fourth embodiment is similar to the first embodiment illustrated in FIG. 4 up to step 136. Once the system has presented a question to a user and the interaction-processing server has calculated a second score, score-2, based on the additional

- 10 data, the decision module then determines if score-2 is lower than LowerBound T4. If score-2 is lower than T4, the decision module proceeds with the interaction. If score-2 is not less than T4, the decision module determines if score-2 is greater than UpperBound T5, where T4 is less than T5. If score-2 is greater than T5, the decision module declines 138 to proceed with the interaction. If score-2 is between T4 and T5 inclusive, the system can iteratively repeat the
15 process of steps 136, 140, and 141.

The information value prediction model 106 can exist in a variety of embodiments. In one embodiment, each question set has an average value. The model 106 can be trained by taking a large set of transactions and by scoring the likelihood of fraud of each transaction with and without the information provided by a particular question set. The model obtains the
20 difference between scores with and without information provided by a particular question set and averages the distances over the set of transactions to obtain a measure of the value of the information provided by a particular question set. This process is repeated for each question set.

Still another embodiment of the friction model 108 determines attrition rates based on the question set, consumer attributes, and transaction attributes. In this embodiment, not only are the transactions broken down by category, but also by attributes of the customer. Thus, a segment of the transactions may involve specialty electronics customers living in the United States, and another segment of the transactions may involve specialty electronics customers living outside the United States.

Both the information value prediction model 106 and the friction model 108 are not limited to being predictive models. Rather these models 106 and 018 can use any of a variety of methodologies known to those of skill in the art to estimate the value of additional data provided by a question set and the attrition costs associated with a question set, respectively. For example, either model 106 or model 108 or both can be expert-rule coded.

Credit card transactions are only one application of the invention. The invention can apply to other situations in which an entity wants to obtain information from its users while fostering the entity/user interaction. Thus, the invention relates to situations in which an entity wants to collect information from a user for a variety of reasons distinct from processing on-line transactions. These reasons can include gathering information for marketing or for research. Entities often use registration forms for such purposes. Completion of the registration form is often a prerequisite for gaining access to portions of a site or to desirable content. Entities that control such sites or desirable content do not want to cause the user to terminate her interaction with the entity, to provide false or incomplete information, or to develop ill will toward the entity. Thus, the invention assists such entities in determining the conditions under which to request information from a user without causing the user to have an adverse reaction.

In one preferred embodiment, a system according to the invention applies the optimization methodology represented by FIGS. 4, 4A, 5, and 5A in determining the initial

question set presented to a user or customer as well as in determining one or more follow-up question sets if necessary. In other words, the system can select an initial question set based on a cost/benefit analysis of presenting different question sets. As noted above, the cost/benefit analysis takes into account the value of the information provided by the question set and the
5 attrition cost of the question set.

As can be seen from the foregoing, the interaction processing system 101 and the decision module 114 allow a fulfillment system 116 to selectively obtain additional information from a user so as to meet the needs of an entity. At the initial stage of a user-entity interaction, the interaction processing system 101 can provide an interaction score. The decision module
10 can use the interaction score to make decisions about the interaction. If the decision module indicates that more information is needed to make a decision about the interaction, the interaction-processing system can derive a question from question set data that has a high probability of leading to non-attrited fulfillment or more generally to a high expected value of fulfillment.

As will be understood by those familiar with the art, the invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. For example, interaction-scoring model 107 can score a variety of interactions in addition to a transaction involving the purchase of goods or services. The system may be used in other than retail environments; it may be used in any environment where it is desirable to provide
15 customized forms or question sets for gathering information. Likewise, the particular naming of the features, attributes, data structures, rules or any other aspect is not mandatory or significant, and the mechanisms that implement the invention or its features may have different names or formats. Accordingly, the disclosure of the present invention is intended to be
20

illustrative, but not limiting, of the scope of the invention, which is set forth in the following claims.

WE CLAIM

1 1. A computer-implemented method for processing a request for an interaction
2 over a computer network, comprising:
3 receiving a request for an interaction from a user, the request including a first set
4 of interaction data for variables descriptive of the interaction;
5 determining a value of the interaction based on the first set of interaction data;
6 and
7 responsive to the value of the interaction, performing at least one of:
8 terminating the interaction;
9 proceeding with the request for an interaction; or
10 obtaining additional data from the user in order to facilitate the
11 determination of whether to proceed with the interaction.

1 2. The computer-implemented method of claim 1, wherein receiving a request for
2 an interaction comprises:
3 generating and forwarding to a user's computer a form for obtaining the first set
4 of interaction data.

1 3. The computer-implemented method of claim 1, wherein receiving a request for an
2 interaction from a user comprises:
3 determining, for each of a plurality of question sets, a probability of non-attrited
4 fulfillment after use of the question set based on a metric of the value of data
5 provided by the question set and on a likelihood that the user will terminate
6 the interaction if the user is presented the follow-up question set; and
7 presenting to the user the question set with the greatest probability of non-
8 attrited fulfillment.

8 presenting to the user the follow-up question set with the greatest probability of
9 non-attrited fulfillment.

1 9. The computer-implemented method of claim 8, wherein obtaining additional
2 data further comprises prior to determining a probability of non-attrited fulfillment:
3 calculating, for each of a plurality of follow-up question sets, a metric for the
4 value of additional data provided by a follow-up question set; and
5 determining, for each of a plurality of follow-up question sets, the likelihood that
6 the user will terminate the interaction if the user is presented with the
7 follow-up question set.

1 10. The computer-implemented method of claim 8, wherein the method further
2 comprises:
3 obtaining a second set of interaction data in response to the follow-up question
4 set;
5 determining a revised value of the interaction based on data including the
6 second set of interaction data; and
7 responsive to the revised value of the interaction, terminating the interaction or
8 fulfilling the request for an interaction.

1 11. The computer-implemented method of claim 8, wherein the probability of non-
2 attrited fulfillment is a function of the probability of non-attrition after presentment of the
3 follow-up question set and a function of the probability that the interaction value will exceed a
4 threshold if the interaction value is based on data that includes data provided in response to the
5 follow-up question set.

12. The computer-implemented method of claim 1, wherein obtaining additional data comprises:
determining a probability of non-attributed fulfillment after presentation of a follow-up question set based on a metric for the value of additional data provided by the follow-up question set and based on a likelihood that the user will terminate the interaction once presented with the follow-up question set.

13. The computer-implemented method of claim 12, further comprising:
calculating a metric for the value of additional data provided by a follow-up question set by applying data representing the follow-up question set and the initial interaction data to a predictive metric model.

14. The computer-implemented method of claim 12, wherein calculating a metric for the value of additional data provided by a follow-up question set comprises:
applying data representing the follow-up question set, initial interaction data, and user data to a predictive metric model.

15. The computer-implemented method of claim 12, wherein determining the probability of non-attributed fulfillment after presentation comprises:
applying the follow-up question set and the initial interaction data to a predictive friction model, the predictive friction model derived from pre-processing past interaction data for a plurality of users to derive past attrition related variables, the past interaction data including variables descriptive of a past interaction and at least one variable descriptive of whether the interaction was attributed.

1 19. A computer-implemented method for processing a request for a transaction over
2 a client-server network, the method comprising:

3 receiving a request for a transaction from a customer through a client computer,
4 the request including a first set of transaction data for variables descriptive
5 of the initial transaction;

6 determining a transaction score based on the first set of transaction data and
7 indicative of a level of risk associated with the transaction; and
8 responsive to the transaction score, performing at least one of:

9 terminating the transaction;
10 proceeding with the request for a transaction; or
11 obtaining additional data from the customer.

1 20. The computer-implemented method of claim 19, wherein obtaining additional
2 data comprises:

3 determining, for each of a plurality of follow-up question sets, a probability of
4 non-attributed fulfillment after presentation of the follow-up question set
5 based on a metric for the value of additional data and based on a likelihood
6 of interaction termination; and
7 selecting the follow-up question set with the greatest probability of non-attributed
8 fulfillment.

1 21. The computer implemented method of claim 19, responsive to the transaction
2 score, performing at least one of:

3 terminating the transaction;
4 proceeding with the request for a transaction; or
5 obtaining additional data from the customer comprises:

6 estimating the likelihood that the user will terminate the interaction if the user is
7 presented with the follow-up question set by applying the follow-up
8 question set to a predictive model, the predictive model derived from pre-
9 processing past interaction data for a plurality of users to derive past
10 attrition related variables, the past interaction data including variables
11 descriptive of a past interaction and at least one variable descriptive of
12 whether the interaction was attrited.

1 27. The method of claim 26, wherein estimating the likelihood that the user will
2 terminate the interaction if the user is presented with the follow-up question set comprises:
3 applying the first set of interaction data, and the follow-up question set to a
4 predictive model.

1 28. The method of claim 26, wherein the method further comprises receiving user
2 data for variables descriptive of past user interactions; and
3 wherein estimating the likelihood that the user will terminate the interaction if
4 the user is presented with the follow-up question set comprises applying the
5 first set of interaction data, the user data, and the follow-up question set to a
6 predictive model.

1 29. The computer-implemented method of claim 28, wherein the method further
2 comprises:
3 obtaining a plurality of follow-up question sets;
4 estimating, for each of a plurality of questions sets, the likelihood that the user
5 will terminate the interaction if the user is presented with the follow-up
6 question sets by applying the initial interaction data, the user data, and the
7 follow-up question set to a predictive model; and

8 selecting the follow-up question set with the lowest likelihood of causing the
9 user to terminate the interaction.

1 30. The method of claim 28, wherein prior to receiving a request for an interaction
2 from a user, the method comprises:

3 training a neural network, the neural network being adapted for predicting the
4 likelihood that a user will terminate an interaction if the user is presented
5 with a proposed request for data, the training process comprising the
6 iterative steps of:

7 pre-processing past interaction data for a plurality of users to derive past
8 attrition related variables, the past interaction data including variables
9 descriptive of a past interaction and at least one variable descriptive of
10 whether the interaction was completed or attrited;
11 applying input data including past attrition related variables to the neural
12 network to generate output data;
13 comparing the generated output data to a desired output; and
14 adjusting operation of the neural network responsive to the results of the
15 comparing step.

1 31. A system for processing a request for an interaction over a computer network,
2 the system comprising:

3 initial interaction data for a user, the initial interaction data including variables
4 descriptive of an initial interaction;
5 user data for variables descriptive of past user interactions;
6 follow-up question set data; and

7 a predictive model for estimating the likelihood that a user will terminate an
8 interaction if the user is presented with a follow-up question set selected
9 from the follow up question set data, based on initial interaction data, user
10 data, and follow-up question set data.

1 32. The system of claim 31, wherein the system further comprises:
2 an optimization module for iteratively invoking the predictive model for each of
3 a plurality of follow-up question sets, and for selecting the follow-up
4 question set with the lowest likelihood of causing the user to terminate the
5 interaction.

1 33. A method for processing a request for an interaction over a computer network,
2 the method comprising:
3 receiving a request for an interaction from a user, the request including a first set
4 of interaction data for variables descriptive of the interaction;
5 calculating, for each of a plurality of follow-up question sets, a metric for the
6 value of additional data provided by a follow-up question set;
7 determining, for each of a plurality of follow-up question sets, the likelihood that
8 the user will terminate the interaction if the user is presented with the
9 follow-up question set;
10 determining, for each of a plurality of follow-up question sets, the probability of
11 non-attributed fulfillment for a follow-up question set based on the metric for
12 the value of additional data and based on the likelihood that the user will
13 terminate the interaction; and
14 selecting the follow-up question set with the greatest probability of non-attributed
15 fulfillment.

1 34. The method of claim 33, wherein calculating, for each of a plurality of follow-up
2 question sets, a metric for the value of additional data provided by a follow-up question set
3 comprises:

4 applying data representing the follow-up question set and the initial interaction
5 data to a predictive metric model.

1 35. The method of claim 33, wherein determining, for each of a plurality of follow-
2 up question sets, the likelihood that the user will terminate the interaction if the user is
3 presented with the follow-up question set comprises:

4 applying the follow-up question set and the interaction data to a predictive
5 friction model.

1 36. A system for processing a request for a transaction over a computer network, the
2 system comprising:

3 a transaction-scoring module adapted for receiving transaction data and for
4 providing a transaction score; and

5 a thresholding module adapted for receiving the transaction score and, based on
6 the transaction score, applying the score to at least one threshold to
7 selectively perform at least one of:

8 completing the transaction,

9 terminating the transaction, or

10 obtaining additional information.

1 37. The system of claim 36, wherein the system further comprises
2 an information value prediction model adapted for receiving data representing a
3 plurality of follow-up question sets and for determining, for each of the

4 plurality of follow-up question sets, a metric for the value of additional
5 information provided by the follow-up question set;
6 a friction model adapted for receiving data representing the plurality of follow-
7 up question sets and for determining, for each of the plurality of follow-up
8 question sets, the likelihood that a user will terminate a transaction if
9 presented with the follow-up question set; and
10 a question set optimization module (a) for determining, for each of the plurality
11 of follow-up question sets, the probability of non-attributed fulfillment based
12 on the metric for the value of additional information provided by the
13 follow-up question set and based on the likelihood that a user will terminate
14 the transaction if the user is presented with the follow-up question set, and
15 (b) for selecting the follow-up question set with the highest probability of
16 non-attributed fulfillment.

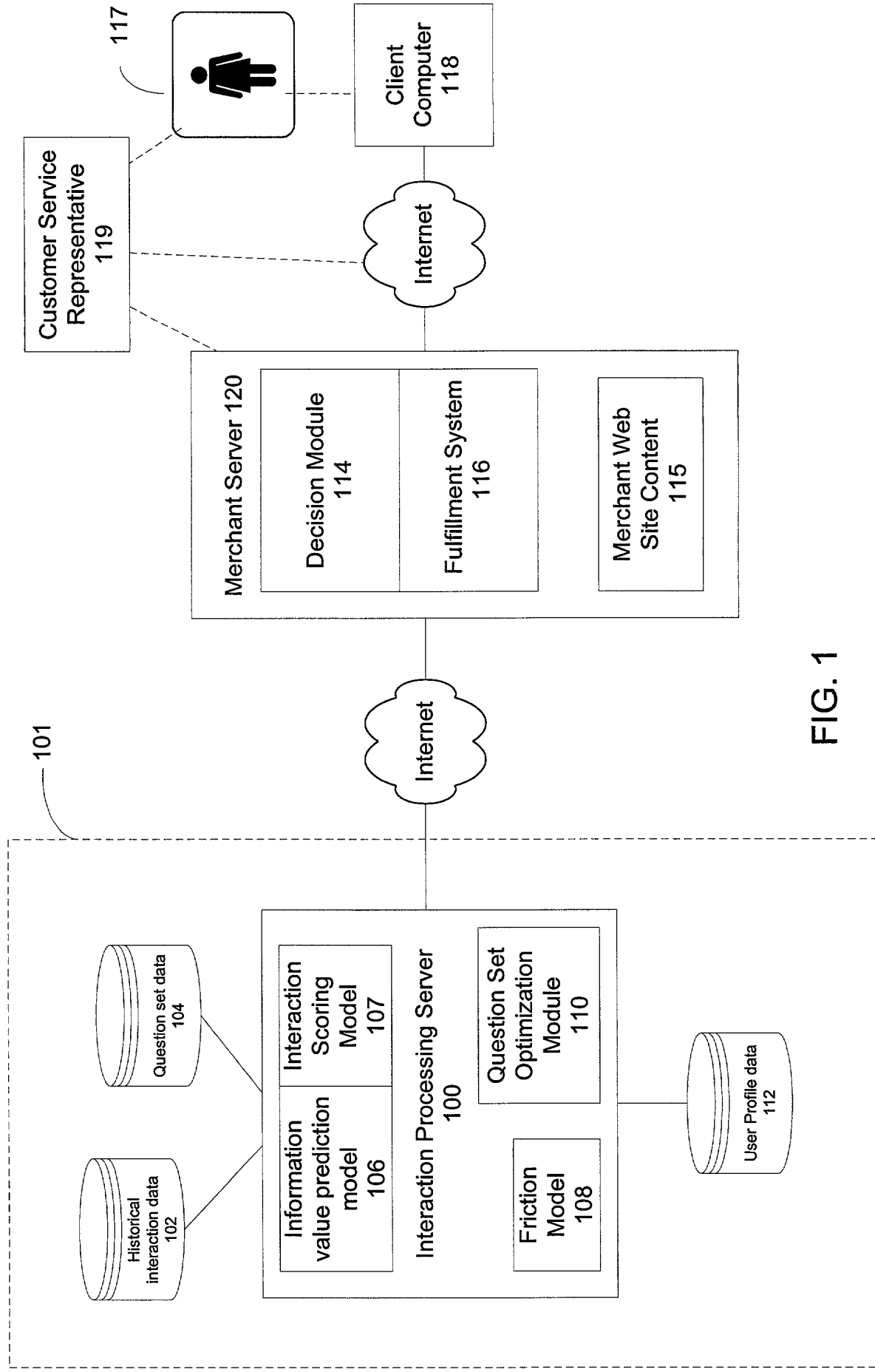
1 38. A graphical user interface for processing a request for a transaction, the
2 graphical user interface comprising:
3 a first web page having embedded therein a first form for obtaining initial data
4 to complete a transaction;
5 a second web page, the second web page having embedded therein a second
6 form for presenting a follow-up question set; and
7 a decision module that selectively sends the second web page to a client
8 computer in response to a value of the transaction calculated based on the
9 initial data gathered by the first web page.

1 39. The graphical user interface of claim 38, wherein the first form requests a
2 minimal amount of information necessary to complete the transaction.

SCORE BASED DECISIONING

ABSTRACT OF THE DISCLOSURE

The invention aids an entity to selectively request additional data about a user to serve the needs of the entity without causing the user to have an adverse reaction. The invention helps an entity to determine the condition under which to request additional data so as to reduce the likelihood of causing the user to have an adverse reaction, e.g., terminate the interaction. One embodiment of the invention concerns customers requesting transactions with on-line merchants. More specifically, this embodiment aids merchants by detecting Internet credit card transactions that are likely to be fraudulent, and providing the merchants with mechanisms for managing a suspected transaction as it occurs to obtain additional information that can be useful to reducing the likelihood of fraud.



2025 RELEASE UNDER E.O. 14176

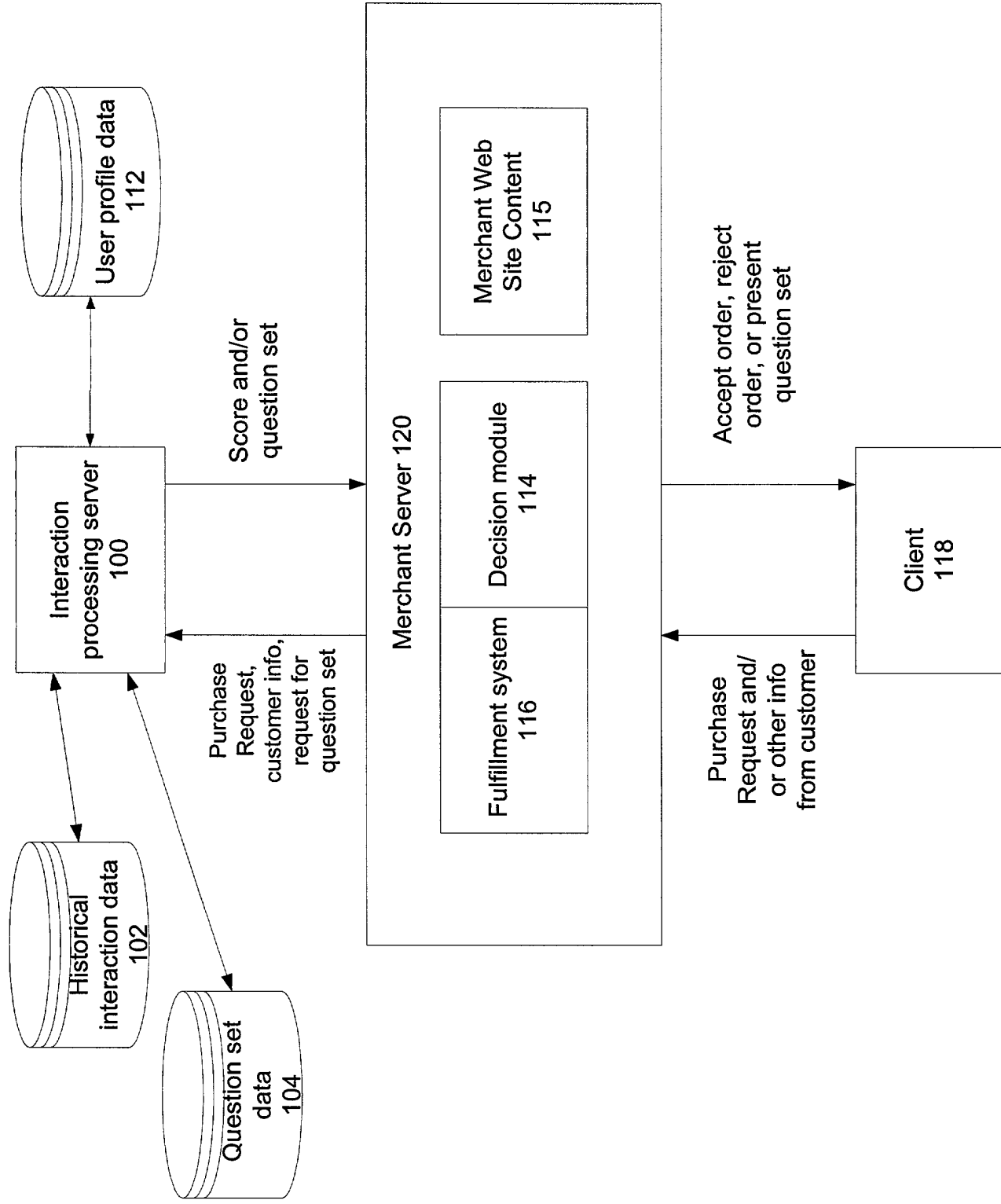
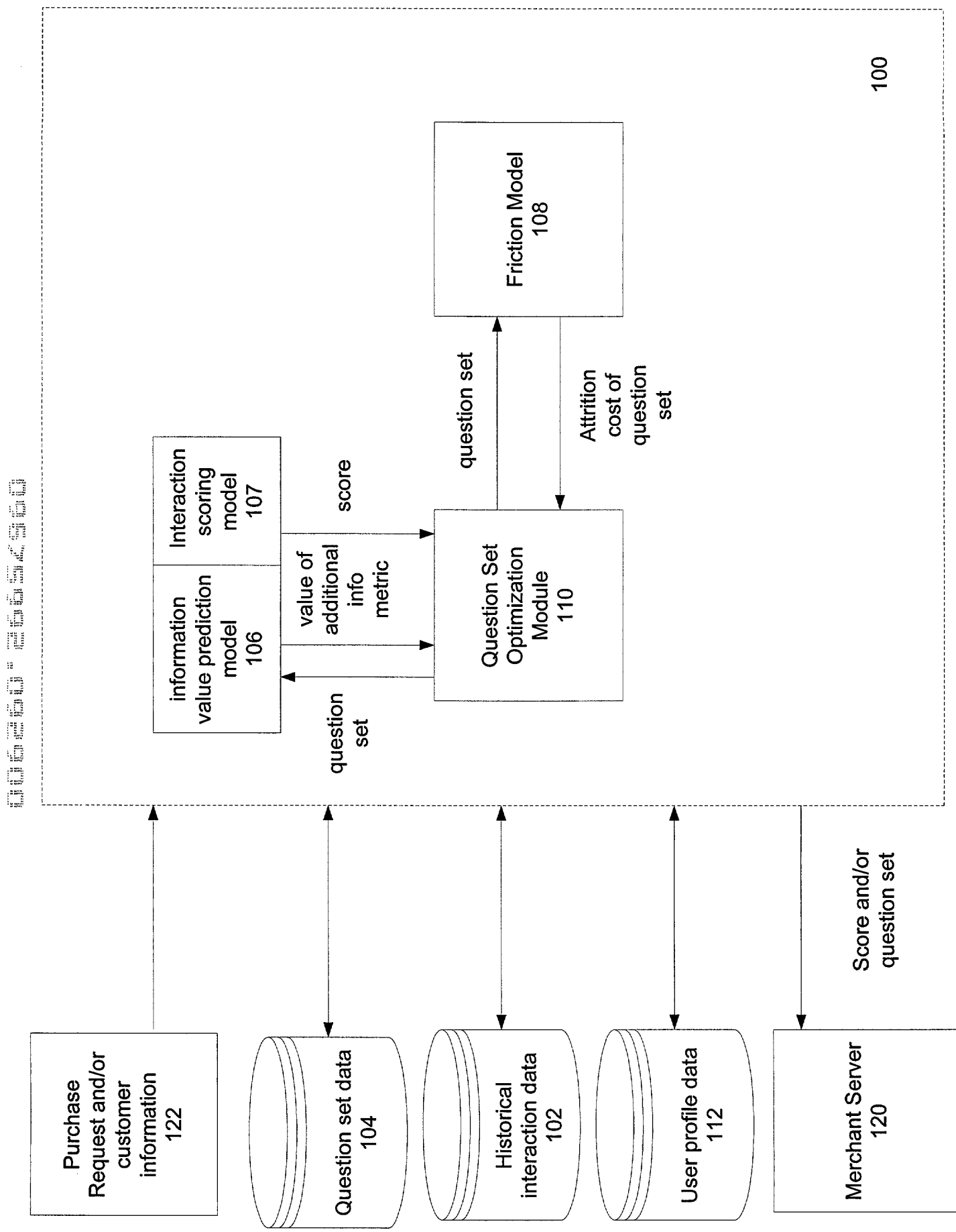


FIG. 2



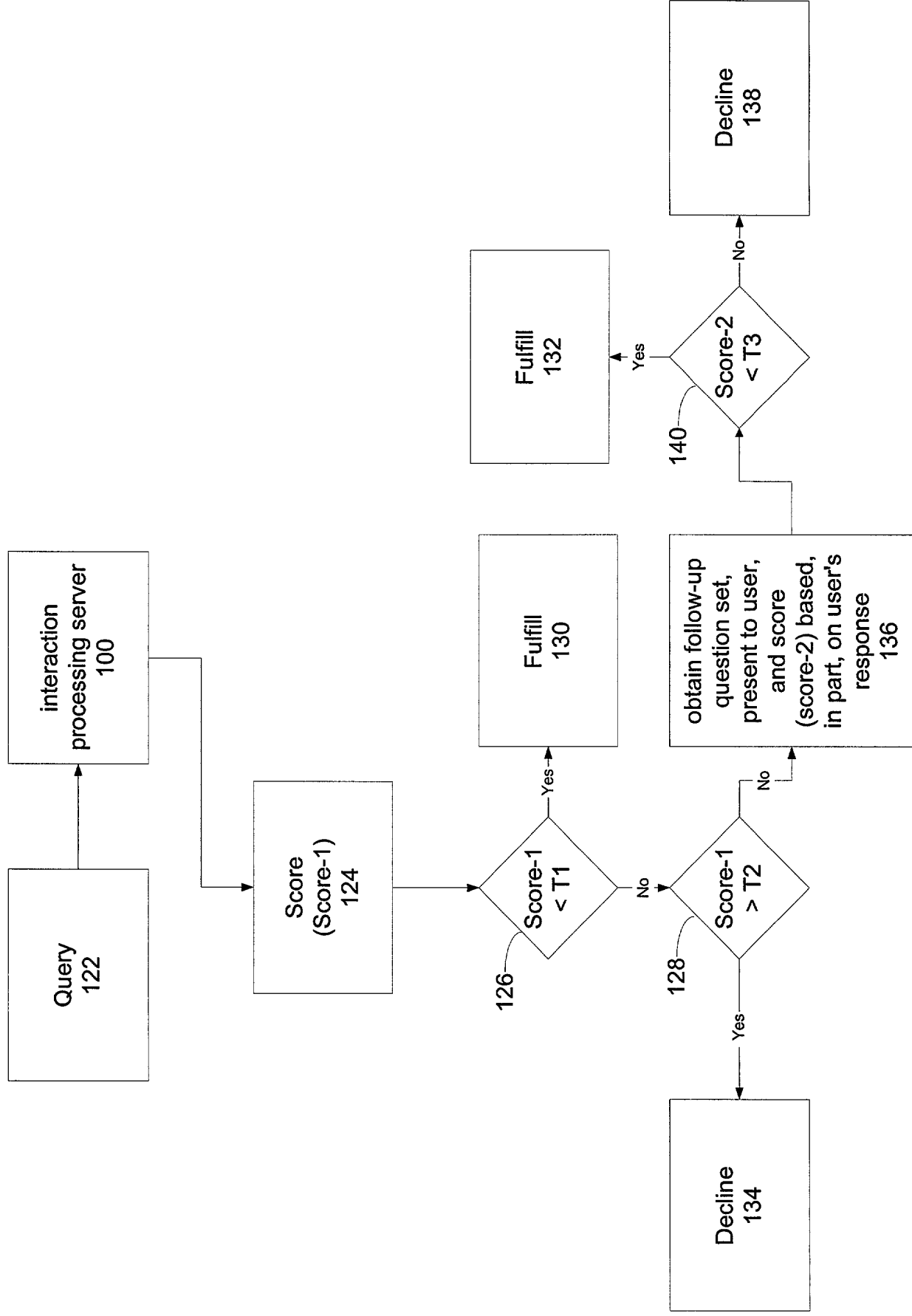
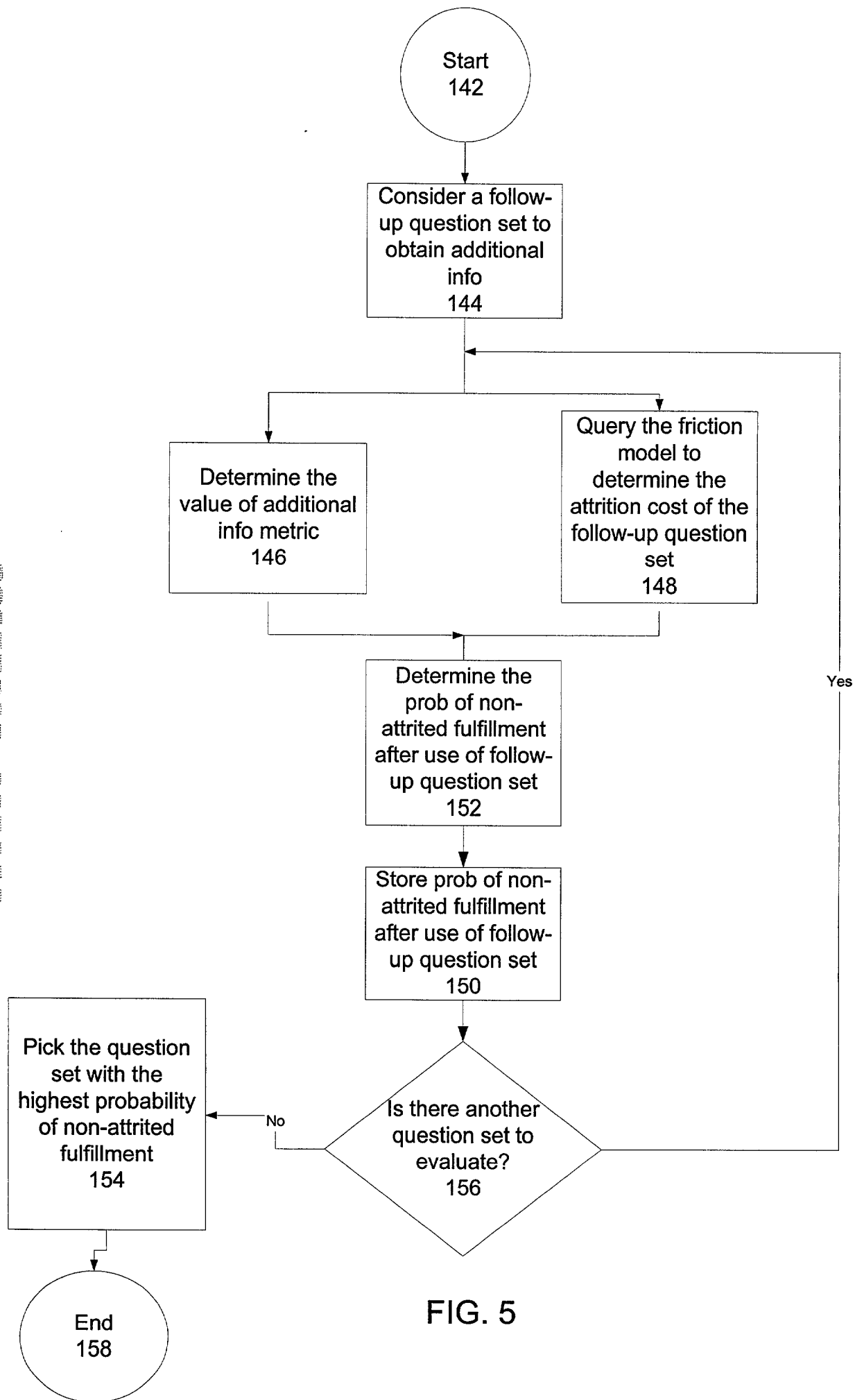


FIG. 4



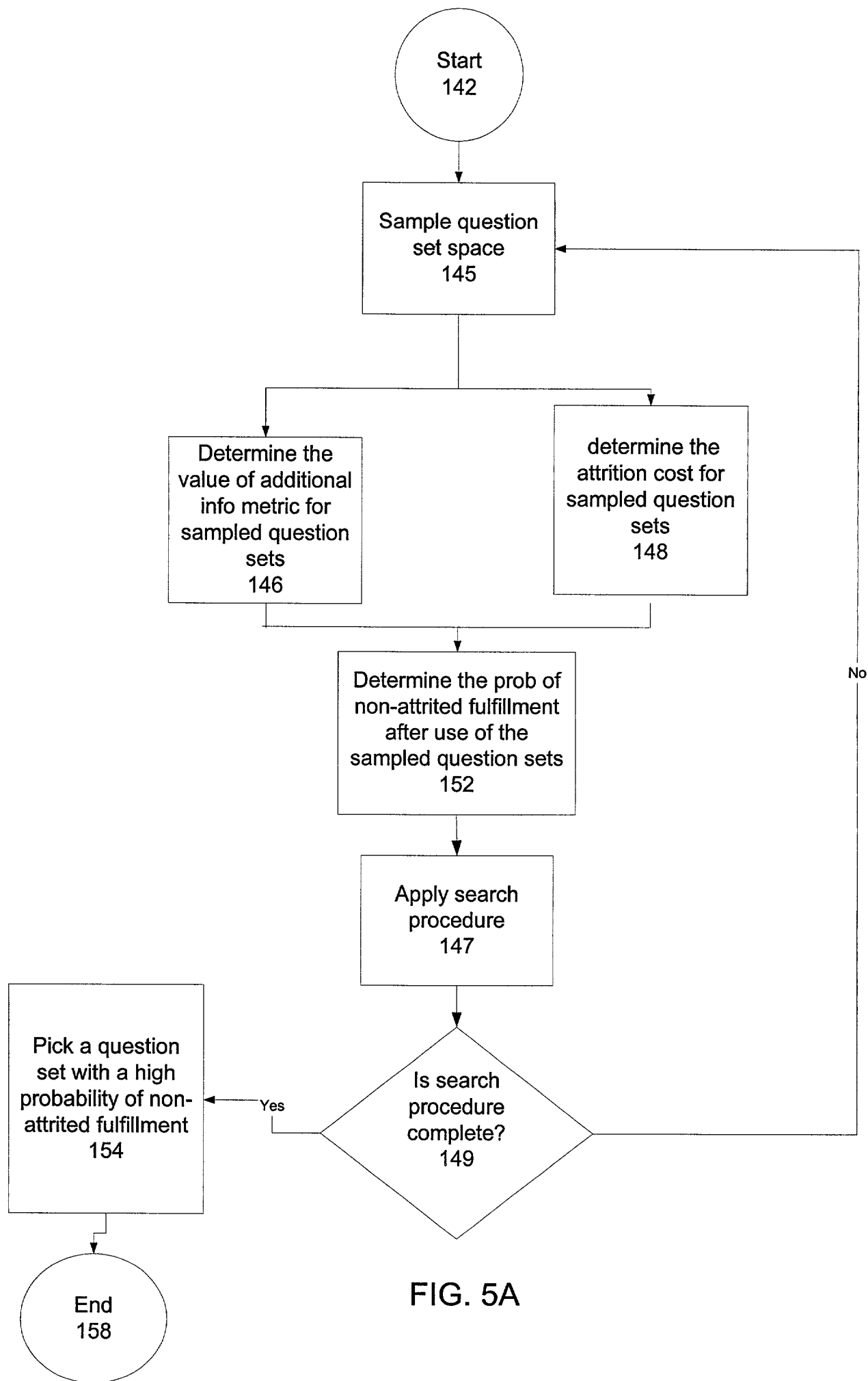


FIG. 5A

CompanyA.com

Ordering online is simple.

Let us walk you through the process.

Please enter your e-mail address:

☐ I am a new customer

Credit Card Type:

Downloaded At: 11:53 11 September 2009

Credit Card #:

Downloaded At: 11:53 11 September 2009

☐ I am a returning customer, and my password is:

Sign in using our secure server

FIG. 6

CompanyA.com				<input type="checkbox"/>		<input checked="" type="checkbox"/>	
Back		Forward		Stop		Home	
<div>Please provide us with the following information so that we can more efficiently process your transaction.</div> <div>Please enter your home address:</div> <div><div>Street</div><div>City:</div><div>State:</div><div>Zip:</div><div>Mother's Maiden Name:</div></div>							

FIG. 7

0010/PTO Rev. 6/95 U.S. Department of Commerce Patent and Trademark Office DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION <input checked="" type="checkbox"/> Declaration Submitted with Initial Filing OR <input type="checkbox"/> Declaration Submitted after Initial Filing	Attorney Docket Number	5122 US
	First Named Inventor	Walter Lee
	<i>COMPLETE IF KNOWN</i>	
	Application Number	To Be Assigned
	Filing Date	September 29, 2000
	Group Art Unit	To Be Assigned
	Examiner Name	To Be Assigned

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SCORE BASED DECISIONING

the specification of which

(Title of the Invention)

☒ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) [] as United States Application Number or PCT International Application Number [] and was amended on (MM/DD/YYYY) [] (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations. § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code § 119 (a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365 (a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority	Certified Copy Attached?	
			Not Claimed	YES	NO
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto:

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental sheet attached hereto.
60/195,156	04/06/2000	

DECLARATION				Page 2	
<p>I hereby claim the benefit under Title 35, United States Code § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.</p>					
U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)		
09/167,102		10/05/1998	USP 5,819,226		
<input type="checkbox"/> Additional U.S. or PCT international application numbers are listed on a supplemental priority sheet attached hereto.					
<p>As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:</p>					
Name		Registration Number	Name		Registration Number
Robert R. Sachs Lorrel A. Birnschein		42,120 P-46,555	Charles E. Schulman		43,350
<input type="checkbox"/> Additional attorney(s) and/or agent(s) named on a supplemental sheet attached hereto.					
<p>Please direct all correspondence to:</p> <p style="text-align: center;">C. Eric Schulman Fenwick & West LLP Two Palo Alto Square Palo Alto, CA 94306 U.S.A.</p>					
Telephone	(650) 858-7841		Fax	(650) 494-1417	
<p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>					
Name of Sole or First Inventor:		<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name	Walter	Middle Initial	W.	Family Name	Lee
				Suffix e.g. Jr.	
Inventor's Signature				Date	
Residence: City	La Mesa	State	CA	Country	USA
				Citizenship	US
Mailing Address					
Mailing Address	5216 Alzada Drive				
City	La Mesa	State	CA	Zip	91921
				Country	USA
<input checked="" type="checkbox"/> Additional inventors are being named on supplemental sheet(s) attached hereto					

DECLARATION					ADDITIONAL INVENTOR(S) Supplemental Sheet				
Name of Additional Joint Inventor, if any:					<input type="checkbox"/> A petition has been filed for this unsigned inventor				
Given Name	Daniel	Middle Initial		Family Name	Shoham	Suffix e.g. Jr.			
Inventor's Signature					Date				
Residence: City	San Diego	State	CA	Country	USA	Citizenship	US		
Mailing Address	5230 Fiore Terrace #K311								
Mailing Address									
City	San Diego	State	CA	Zip	92122	Country	USA		
Name of Additional Joint Inventor, if any:					<input type="checkbox"/> A petition has been filed for this unsigned inventor				
Given Name	Wesley	Middle Initial	K.	Family Name	Wilhelm	Suffix e.g. Jr.			
Inventor's Signature					Date				
Residence: City	Spokane	State	WA	Country	USA	Citizenship	US		
Mailing Address	3812 East 48 th Avenue								
Mailing Address									
City	Spokane	State	WA	Zip	99223	Country	USA		
Name of Additional Joint Inventor, if any:					<input type="checkbox"/> A petition has been filed for this unsigned inventor				
Given Name	Joseph	Middle Initial	P.	Family Name	Milana	Suffix e.g. Jr.			
Inventor's Signature					Date				
Residence: City	San Diego	State	CA	Country	USA	Citizenship	US		
Mailing Address	11222 SunnyDale Court								
Mailing Address									
City	San Diego	State	CA	Zip	92127	Country	USA		
Name of Additional Joint Inventor, if any:					<input type="checkbox"/> A petition has been filed for this unsigned inventor				
Given Name	Alan	Middle Initial	P.	Family Name	Jost	Suffix e.g. Jr.			
Inventor's Signature					Date				
Residence: City	San Diego	State	CA	Country	USA	Citizenship	US		
Mailing Address	18605 Lancashire Way								
Mailing Address									
City	San Diego	State	CA	Zip	92128	Country	USA		
<input type="checkbox"/> Additional inventors are being named on supplemental sheet(s) attached hereto									